DMSTTIAC

Defense Modeling, Simulation and Tactical Technology Information Analysis Center

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Internet Resource Search Tools

Analyses and Assessment

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This document provides a top level assessment of current and relevant internet resource finding tools that enable readers to improve their information gathering capabilities. It provides resources and lists of search engines and a comparison of the types of information provided by each discussed search tool. The report will aid DoD components in evaluating the types and varieties of internet database search tools that mat be helpful to the researcher trying to locate specific types of information on the internet.

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Analysis and Assessment

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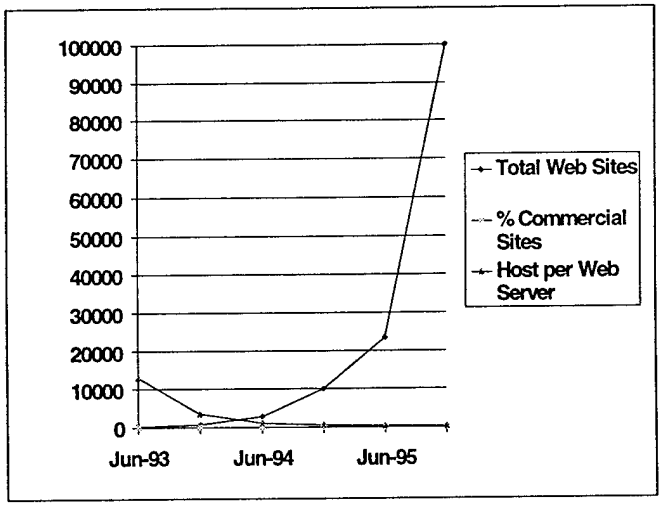
An Analysis and Assessment of Internet Resource Search/Finding Tools

Summary and Overview

The phenomenal growth of the Internet and the World Wide Web ***(see Table 1)*** provides a vast array of information resources that enables users to have free or restricted access to the latest technical information that may impact their government organization or commercial business. We have prepared this report based on the broad assumption that readers are using the latest software versions of **Netscape Navigator** ™ or similar software program to "browse" the World Wide Web, yet have secondary access to WAIS and GOPHER. However, knowing how and where to look for information on the Internet can be as difficult as figuring out what to do with so much information once you find it. The World Wide Web is just another way to get information from the Internet. Access to the Web and on-line search services provide a free, expedient manner for conducting fairly detailed searches of some specific fields--such as simulation. Each service or "search engine" has its own method of cataloging what it finds on the Internet, some have a staff of people who do nothing but "cruise or surf" the "net" all day, recording what they find and even writing short reviews of pages. Others use automated computer programs that "crawl" through the Internet, building a database of what they find, and yet others catalog only hotlinks--the blue or colored, clickable words. When you perform a search you're actually searching that catalog. With few exceptions, each service claims to have the largest catalog of information, however all these catalogs differ slightly.

Table 1. The Boom In World Wide Web Sites



	June 93	Dec 94	June 94	Dec 94	June 95	Jan 96
Total Web Sites	130	623	2738	10,022	23,500	100,000*
Percent Commercial Sites	1.5	4.6	13.5	18.3	31.3	50.0
Hosts per Web Server	13,000	3475	1095	451	270	94

*Since Jan 96, the Web has grown to more than 225,000 sites according to InsWeb (http://risknet.com/scc/whitepaper/growth.htm) Source: " Web Growth Summary" by Matthew Gray, MIT.

I. Purpose

This report is an assessment of Internet resource finding tools that will enable readers to improve their information gathering capabilities. It is a broad overview and recommendation (and not endorsement) of search tools for users desiring information "on the fly". The nature and complexity of the Internet and World Wide Web is in an acknowledged fact. Readers are advised that the aim and intent of this report is to provide a top level assessment of ***current and relevant*** resources, subject to change without advance notice.

We have provided analysis in Table 2 which reveals the results of seeking information on common free search engines. We used the not-so-common parameters as indicated by the search terms on the top row. The columns indicate the numeric search results or hits and the apparent disparity among the search engines. Search tools or "engines" fall into two broad categories: individual ***search engines*** and ***metasearch*** engines which are capable of searching multiple sites and collating the results. Since the two types of engines operate differently, a table is provided indicate a representative search result on four categories or search terms.

Table 2. Search Engines Results

Search Engines	*Modeling & Simulation*	*Tactical Technology*	*Special Forces*	*Distributed Interactive Simulation*
Alta Vista Search http://www.altavista.digital.com	200	156	3,000	2,000
Excite Search http://www.hotbot.com	55,808	111	158,742	18,079
HotBot http://www.hotbot.com	5,122	239	8,419	3,004
Infoseek Ultra http://www.ultra.infoseek.com	380	4	3,729	1,397
Lycos http://www.lycos.com	11,645	12,407	36,252	17,822
Magellan Internet Guide http://www.mckinley.com	67,786	3,932	28,601	41,295
Open Text http://index.opentext.com	8,734	2,025	8,833	1,140
WebCrawler http://webcrawler.com	611	22	282	103

Yahoo http://www.yahoo.com	100	5	16	6
MetaCrawler http://metacrawler.com	66	45	56	55

II. Sample of Search Engines Reviewed

1. **Alta Vista Web and Usenet Search** (See Sample 1)

This recently-released search service is extremely fast, current, and comprehensive. It searches the entire full-text of Web pages and Usenet articles. Alta Vista is appropriate for *beginning searchers*, but it also has many advanced search features. Within a simple search, users can search for exact phrases, require or prohibit words, search within the title field of an HTML document, search for documents that contain a link to a particular URL, use wildcards, and employ case sensitivity. The advanced query allows for the use of Boolean operators (AND, OR, NOT, NEAR) and lets users limit searches by date. Alta Vista was created to demonstrate Digital's hardware and software; expect to be able to license this technology soon.

Creator: Digital Equipment Corporation. It claims coverage of more than 21 million Web pages containing more than 8 billion words. One of the largest, if not the largest Web index. Also allows searching of more than 13,000 Usenet newsgroups . Given its comprehensiveness, Alta Vista excels at finding obscure bits of information virtually anywhere on the Web....consistently more comprehensive than any of the other navigators tested. It is probably the most effective among the engines tested...and its search engine doesn't support stemming. A power search option makes it possible refine a query use "and," "or," or "not" in addition to "near." It can automatically generated index to Web sites and Usenet news postings that ranks with WebCrawler and Deja News in speed, quality, and comprehensiveness. Searching is an either/or proposition: you can't search both newsgroups and Web sites with the same query. As with the other mega-huge indexes on the Web, users are advised to begin with highly specific search terms otherwise you'll find yourself browsing through hundreds of screens of search results. Alta Vista is hosted by Digital Equipment Corporation. Access World Wide Web pages and Usenet News with contents up to 16 million Web pages and the full-text of over 13,000 newsgroups updated in real-time. The searching offers a simple search or advanced query mode. Advanced query mode offers boolean (and, or, not) and simple adjacency (near) operators, as well as an option for additional words to use to rank the search results (occurrence of the word(s) within retrieved documents will make them sort higher in the list). Results: Offers three results options: 1) the number of matches (with none of them displayed), 2) "Compact" results that puts each item on one line (the link on the left, followed by the last update date of the file, then the machine-generated abstract scrolling off the screen to the right), and 3) "Detailed" results (the default option) with the link followed by the machine-generated item abstract in an indented paragraph with the URL at the bottom, the file size and the last update date. Results are returned ten items on a screen. Update Frequency: Constantly by Web robot ("Scooter").

This kind of power, and the comprehensiveness of Alta Vista's database, makes the site a great place to begin a search. Only MetaCrawler's metasearch engine offers more comprehensive coverage.

2. Excite Search

Excite offers an elegant, customizable user interface to search Web pages and the past two weeks of Usenet postings. Users can search in plain English or by keywords. If you like a search result, Excite also lets you say "give me more documents like this one." Additional features include a catalog of reviewed sites (links include one- to four-sentence descriptions of the site) and current news from Reuters. Webmasters can use Excite's search engine on their own web pages; Netscape uses Excite for Web Servers 1.0, which is available for free, on its site. It is smart and user friendly and searches more than 1.5 million Web pages. It also includes a directory of "reviewed" sites. It searches more than a million Usenet articles. It provides a database content search-Full-text of about 1.5 million Web pages; FTP/Gopher/Newsgroups. Searching capabilities include refining results/Case sensitive/Boolean-other operators/ Descriptions-Annotations. It is perhaps among the best of the search engines for staying current. It did a fairly good job at finding relevant information. It was about equal to OpenText in the quality and quantity of its search results. Its only drawback is that only simple phrases can be searched and no Boolean operators are supported. Buttons that promise a 'refine search' option...should be labeled 'start over'. But it is a fast and friendly tool for searching full-text of 1.4 million Web pages and hundreds of Usenet newsgroups. Excite ranks with WebCrawler and Lycos is its usefulness as a Web search tool, with DejaNews as a Usenet search tool. Searches can be conducted by concept words or keyword. While Excite will likely find the information you want, it doesn't offer the sophistication of tools like Alta Vista, and its interface can be frustrating--especially when it comes to newsgroups. Excite's default search covers the Web using a concept search, although you can also opt for a more traditional keyword search...you can enter search terms in plain English; no special syntax or operators are required. The engine lists results in order of relevance, with a hard-to-decipher icon showing broad ranges of certainty. You can click on this icon to find similar documents, thereby refining your search without having to submit any new terms. The results of an Excite search include a hotlinked document title and a summary. But you won't get a Uniform Resource Locators (URLs) for the document. If you prefer, you can change from a relevance-ranked listing to one that's sorted by site--just click on a button at the top of the results page. You cannot, however, choose to sort by site until Excite has already performed a search sorted by relevance. It has an imperfect interface: If you're accustomed to using your browser's Back button to navigate, you may find Excite's interface troublesome. Unless you use the site's own navigational tools, your previous searches are wiped out when you return to the search page. You can avoid this problem by clicking on Excite's Revise Search button. We would prefer the ability to

type new search terms in a field at the top of the page (as Alta Vista allows). Using Excite to search Usenet newsgroups can also be frustrating. When Excite finds articles of interest, it provides a relevance rating and a linkable title (the article's subject), but it does not include the article's date or the name of the newsgroup that the article was posted to... less helpful than the newsgroup searches used by Infoseek Guide. On the positive side, you can search Excite's reviews of 50,000-plus Web sites.

3. Lycos: The Catalog of the Internet (See Sample 2)

Though many users have long considered Lycos to be the search service of choice, its competitors now claim that their services are larger, faster, and more accurate. Users can perform simple Boolean keyword searches (AND, OR), set the relevance feature looser or stronger in order to return a greater number or lesser number of documents, and customize how their results are displayed. Lycos also owns Point Communications, which offers a news service and a subject catalog of reviewed Internet sites. Each review includes a one-sentence description and numeric ratings based on content, presentation, and total experience. -- 19 million unique URLs of which 11.5 million are Web pages. This makes Lycos unique because it contains a large number of binary files in its base including GIF, JPEG, wav, and MPEG. It also indexes FTP archives and Gopher menus. Lycos has a rather large data base and provides the most comprehensive results. However, the size of the report is overwhelming. We generally did not find relevant information on the first two or three pages of Lycos' searches as we did with Excite, InfoSeek, and OpenText searches. It is an Internet search tool from Carnegie-Mellon University and provides a search engine that goes out on the Net to collect data. Over 8.5 million unique URLs were identified by October 7, 1995. A new service at Lycos is the Lycos 250, a hot list of top sites on the Web. There are over 10 million URLs. Its contents include abstracts that contain the titles, headings, subheadings, 100 most significant words and first 20 lines of each file. With regard to searching, there is no way to specify adjacency in terms, but adjacency is used to rank relevance; results are scored and listed in order. Results are listed in ranked order; information includes document address (URL), title, file size, and an excerpt from the file. Update frequency: Weekly (An automated web roaming process samples the network continuously for more information to add, but the database is rebuilt once a week.) Additional Information: Lycos offers a Frequently Asked Questions document for additional information about its service. Service runs on several Sun SparcStations to distribute the load, nonetheless is sometimes too busy to accept a search. For each document fetched, Lycos keeps the title, headings, subheadings, links, the 100 highest weighted words, and the first 20 lines. Plans include adding the standard Boolean operators (AND, OR and NOT) to search options. What is indexed: document titles, headings, links, content: 100 most "weighty" words (using an algorithm which considers order placement and frequencies, among other factors) from the documents; first 20 lines; size in bytes and

number of words . Search entries: Keywords. Boolean queries Phrases/adjacency not yet implemented. (cf. Lycos Search language) Indexing software: Lycos web explorer, and can bring in 5,000 documents per day Search software: Lycos 0.9beta10. The Pursuit search engine provides probabilistic retrieval from the catalog, taking a user's query and returning a sorted list of hits. (The list is sorted by match score, and only documents with scores above the threshold are retrieved.) The searcher will prefer documents that match more of his search terms, that match his term more closely (glow matches glows better than glowworm), that have more occurrences of any one term, and occurrences earlier in the document. Appending a period (.) to a term forces an exact match on that term. Negation and prefix matching are possible to influence the results and weights. Result displayed: all indexed information (link, document outline, keyword list, excerpt, size). It is possible to set the number of hits in the forms-based search. Update period: The index is updated weekly. Performance: 5 computers handling up to 106,000 users per week. **Good times to search are before 11am EST, or after 6pm.** Heavy usage. General remarks: largest, most up-to-date, good harvesting and indexing principles. Server lists and frequency statistics available in Lycos Results. Accessibility/Response time - fair (best to use during non-peak times). Searching: Boolean operators - no; Weighted terms - yes; Bound phrases - no; Limit to specific fields - no; Truncation - yes. Results display: Ranked by relevancy - yes; Annotations - no, excerpts. Lycos is well known as an easy-to-use, powerful tool for locating information on the Web. Lycos not only provides a relevance rating (which ranges from a low of 0.0 to a high of 1.0), but it also indicates how many terms in your search expression were actually matched. This information can be helpful because Lycos, by default, searches for occurrences of ANY specified term, not all of them. You can change this behavior on a search form page, instructing Lycos to search for each term AND the others instead of each term OR the others. You can also set a threshold for the minimum number of terms that must be matched (anywhere from 2 to 7). This allows Lycos to perform narrower multiple-term searches or to search for terms that could have multiple spellings. Unless you change settings, Lycos provides a linkable title, an outline, an abstract, and a URL for every page that it returns. You can opt instead to show summary results, which include just the linkable title and Lycos' rating. Or you can get further information in a detailed results report that supplies you with the number of links a page has to other pages, as well as the words matched on the page--probably more information than you'll normally need. Lycos has one unfortunate drawback: it excludes certain common "stop" words such as "the", "and", and "new" from its searches--and there is no way to get around this limitation.

4. Magellan: Mckinley's Internet Directory

Magellan went online in mid-August, 1995 and instantly took a place as one of the premier resource directories on the Web. Although Magellan's 20,000 records are fewer than half the number in Yahoo, Magellan goes beyond Yahoo by offering both a star rating and a brief

description of each site. Magellan's only failing is that it works far better for searching than browsing. Users seeking the best results should take the time to master the search engine and run specific rather than general searches.

5. Metacrawler: A Comprehensive Place To Start Searching (See Sample 3)

If you are quite sure of what you are looking for, the best place to start is Metacrawler. This metasearch engine can simultaneously query a variety of sites. With such wide coverage, it's hard to come up empty handed. But you won't be overwhelmed, either, because Metacrawler eliminates duplicate entries. It's interface is easy to use and lets you restrict your searches to particular geographical areas of Internet domains (***.gov, .com, .edu, .org and so forth***) and you can set a time limit, too. It is an excellent search tool that combines results from Excite, Alta Visa, Lycos, WebCrawler, InfoSeek's trial database, Yahoo, and EINet Galaxy to create a comprehensive hot list of Web resources for any query. Result sets specify name, URL, the database that the resource was found in, and any annotations that could be found in the source database. Searches can be limited by locality, region, and country. MetaCrawler was developed by Erik Selberg and Oren Etzioni of the University of Washington.

III. Other Navigators: Sources for Library Online Catalogs, Government Information, Ejournals, Software and Products and Services

1. **HYTELNET on the World Wide Web**: This is the utility which gives an IBM-PC user instant-access to all telnet-accessible LIBRARY CATALOGS, FREE-NETS, BBSs, Gophers, WAIS, etc. Very valuable considering, for example, that access to one engineering library could provide access to tens of thousands of references to important documents.
   http://moondog.usask.ca:80/hytelnet/ http://www.einet.net/hytelnet/HYTELNET.html

2. **Government Information INFOMINE**: Thousands of links to primarily U.S. Federal Internet resources. Included here because this material is important to many disciplines.
   http://lib-www.ucr.edu/govinfo.html

3. **Site City: Internet Resource Picks from UCR's INFOMINE** - The locations for many of the largest directories of ejournals are provided in this guide.
   http://lib-www.ucr.edu/pubs/ejournal.html

4. **Site City: Internet Resource Picks From UCR's INFOMINE** -
   Locations of archives or repositories for popular and other software, freeware and shareware will be found here.
   http://lib-www.ucr.edu/pubs/software.html

5. NYNEX Interactive Yellow Pages (products and services)
   http://www.niyp.com

6. New Rider's WWW Yellow Pages (products and services)
   http://www.mcp.com/newriders/wwwyp

IV. Other Academic Library Internet/Web Collecting Efforts

Libraries are in the business of, among other things, organizing and providing easy access to information. Many Libraries do this in working with Internet resources. Some provide extensive search engines with which to ply their comprehensive collections while others provide simple subject lists. The resources included tend to be well-chosen and important. This category of finding tool can be of special value to beginning and advanced searchers alike.

1. University of California Libraries:
Search for resources already entered for your subject (or allied subjects). These will have resources with links to other sites which may be relevant to you.
http://lib-www.ucr.edu

2. UCSB: InfoSurf Subject Resources
http://www.library.ucsb.edu/resource.html

3. UCSD: Resources by Subject-Library
http://infopath.ucsd.edu/library/branch/index.html

4. UCSC: Subject Guide to Online Resources
http://www.ucsc.edu/subject/index.html

5. UCB: Internet Resources by Subject
http://www.lib.berkeley.edu/Collections/internet.html

V. Directories of Academic and Other Libraries with Internet/Web Presences and Possible Subject Collections

1. Libnet
   http://sunsite.Berkeley.EDU/Libweb/

2. The World-Wide Web Library Directory
   http://www.albany.net/~ms0669/cra/libs/libs.html

3. Library and Related Resources
   http://www.ex.ac.uk/~ijtilsed/lib/wwwlibs.html#uklibs

VI. Directories of University Internet/Web Sites for Access to Possible College and Departmental Subject Collections

Often the only way to find Internet information on a very specific topic is to go to a college/department that you know is strong in the subject of interest. These directories will get you to resources you want to find sometimes when other routes just aren't working. Searching results will vary widely: some colleges and departments maintain substantial collections of well-chosen links while others contain none. It is often more productive to first use virtual libraries/subject guides/navigators. Still, this "traditional" directory approach can be quite useful.

1. UC Campus Servers
   http://www.ucop.edu/ucophome/ucservers.html

2. Academic Organizations : California WWW Servers
   http://www.calif.com/ca/academia.html

3. American Universities
   http://www.clas.ufl.edu/CLAS/american-universities.html

4. College and University Home Pages - Alphabetical Listing (Int'l.)
   http://www.mit.edu:8001/people/cdemello/univ.html

VII. Tools for Augmenting a Collection/Keeping Current/Scouting

1. Search in the Internet Enabling Tools INFOMINE for the term "scouting" .
   http://lib-www.ucr.edu/enbinfo.html

Whats New Functions:

"What's New" is a common feature in many of the virtual libraries and subject lists mentioned. This feature allows you to see new additions without having to search through whole collections for them and is of great use in keeping current within tools you know and use a lot. What's New features and the Listing and Reviewing services which follow in the next section share many functions.

2. Yahoo- What's New (See Sample 4)
   http://www.yahoo.com/new/

3. BUBL Updates
   http://www.bubl.bath.ac.uk/BUBL/Updates.html

4. Meta-List of What's New pages
   http://www.seas.upenn.edu/~mengwong/whatsnew.list.html

5. The Net-Happenings list
   http://www.mid.net:80/NET/

6. What's New Too!
   http://newtoo.manifest.com/WhatsNewToo/

7. NCSA What's New Page
   http://www.ncsa.uiuc.edu/SDG/Software/Mosaic/Docs/whats-new.html

8. "What's New" features are provided in all INFOMINEs
   http://lib-www.ucr.edu

VIII. Keys: The Bottom Line

1. Be specific; the more specific you can get, the sooner you will find what you are looking for.

2. If you don't find what you are looking for the first time, don't hesitate to try the same search elsewhere first.

3. Always develop a search strategy; think of what words describe what you are looking for.

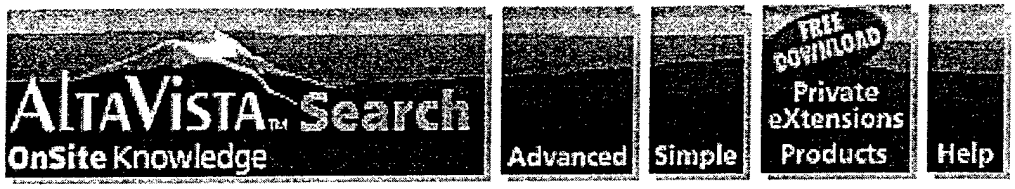
4. Think of alternative choices and related subjects for more thorough searches.

5. Capitalize search words only if they are proper pronouns. Most of the reviewed services can tell the difference. Use quotation marks if a term you want to search for involves two words or more, such as **"modeling and simulation"**

Sample Pages

Sample 1

http://altavista.digital.com/cgi-bin/query?pg=q&
what=web&fmt=.&q=DMSTTIAC



Search the Web **and Display the Results** in Standard Form

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Tip: When in doubt use lower-case. Check out Help for better matches.

Word count: DMSTTIAC:500

Documents 1-10 of about 200 matching the query, best matches first.

DMSTTIAC-ORL-ANN
DMSTTIAC-ORL-ANN. Chronological List of 2 messages as of 08 15:56:34 96. [Alphabetical List] [Subscribe] [Archives] [Search] DMSTTIAC S/C 11/96++ Info...
http://chat.sc.ist.ucf.edu/confs/DMSTTIAC-ORL-ANN/ - *size 1K - 8 Dec 96*

DMSTTIAC Catalog
DMSTTIAC Catalog. What's New. This Catalog is Currently Under Construction! Please check back. Draft Standards Documents. [std1001] Application Protocols,.
http://dmsttiac.sc.ist.ucf.edu/products/catalog/ - *size 6K - 25 Oct 96*

DMSTTIAC Services
DMSTTIAC Services. What's New. Information Requests. DIS Newsletters. External Sources of Interest.
http://dmsttiac.sc.ist.ucf.edu/services/ - *size 923 bytes - 25 Oct 96*

DMSTTIAC Associate COTRS
DMSTTIAC Associate COTRS. Assistant Technical Monitor. Mr. Howard C. Race Army Materiel Command Smart Weapons Management Office US Army Missile Command...
http://www.dtic.dla.mil/iac/iac_dir/dmstatms.html - *size 3K - 15 Nov 96*

DMSTTIAC Information Requests
DMSTTIAC Information Requests. What's New. Current Information Requests. DIS Program Analysis (8 Sep 95 - 25 Sep 95) Completed Requests. M&S Benefits....
http://dmsttiac.sc.ist.ucf.edu/services/ir/ - *size 2K - 25 Oct 96*

DMSTTIAC Products

DMSTTIAC Products. What's New. Product Catalog. Product Support Information. ModSAF. Track product shipments online. UPS Package Tracking. FedEx Airbill...
http://dmsttiac.sc.ist.ucf.edu/products/ - *size 1K - 25 Oct 96*

DMSTTIAC Links

DMSTTIAC Links. Hyperlinks to other DIS related information sources. What's New. -A- ACM Transactions on Computer M&S. Ada Simulation Development System...
http://132.170.192.52/services/others.htm - *size 10K - 25 Oct 96*

What's New at DMSTTIAC

What's New at the DMSTTIAC Service Center. 2 Aug 96 ... Electronic Conference update. The ARMY-A2ATD conference is CLOSED. 25 Mar 95 ... Electronic...
http://132.170.192.52/new.htm - *size 4K - 25 Oct 96*

DMSTTIAC Inquiry Submission

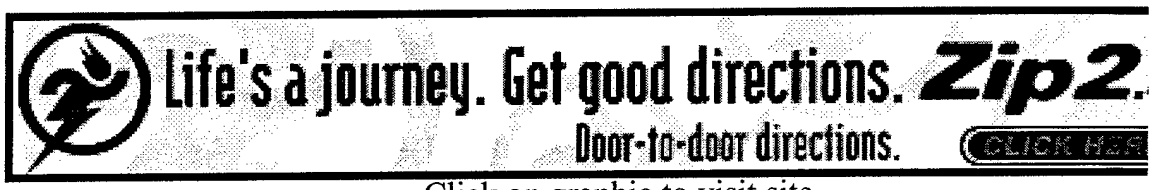
DMSTTIAC Formal Basic Inquiry Submission Form. The Formal Basic User Inquiry is processed by this submission form (recommended) or email to...
http://dmsttiac.hq.iitri.com/information/basic2.html - *size 2K - 29 Mar 96*

What's New at DMSTTIAC

What's New at DMSTTIAC. Apr 12, 96. FMTI - Future Missile Technology Integration Information have been added. Mar 7, 96. Submission Form - An electronic...
http://dmsttiac.hq.iitri.com/whats_new.html - *size 4K - 15 Apr 96*

Sample 2

http://WWW.lycos.com/



Click on graphic to visit site.

I want to search

LYCOS

It's amazing where Go Get It will get you.

The Web for: Go Get It Custom Se

Custom Search
Site Map
Inside Lycos
Club Lycos
Free Software
New 2 Net
Help
Talk to Us

On Lycos Now:

- 7 Dog Years on the Web
- Ski, skate, luge, mush!
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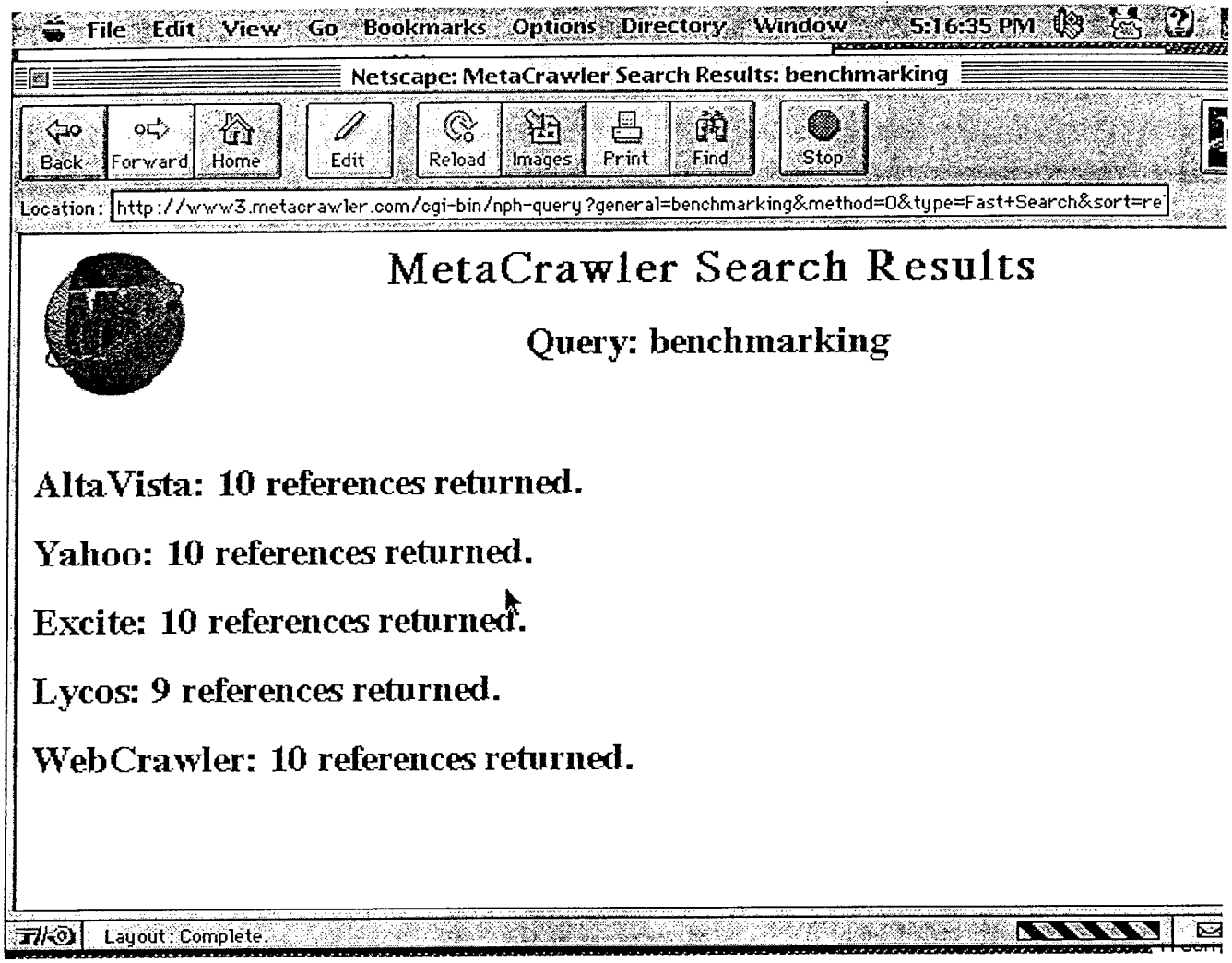
Questions & Comments

Sample 3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Netscape: MetaCrawler Search Results: benchmarking
Back Forward Home Edit Reload Images Print Find Stop
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MetaCrawler Search Results
Query: benchmarking
AltaVista: 10 references returned.
Yahoo: 10 references returned.
Excite: 10 references returned.
Lycos: 9 references returned.
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